

Photo by Mark Sabbatini/The Antarctic Sun

Joe Yarkin, left, and Pat Plaia install a set of solar panels on the roof a shelter at a field camp on Mount Erebus. The solar panels and a wind generator are designed to provide most of the camp's power.

Seeking shaky ground

By Kristan Hutchison
Sun staff

Indonesians may not like it, but geophysicists studying in Antarctica are rooting for some sizeable earthquakes. Vibrations from those quakes and others around the world could reveal what lies beneath the Transantarctic Mountains.

"We're hoping for a lot of earthquakes in the southern hemisphere," said Doug Wiens, from Washington University in St. Louis, one of three principal investigators working on the project. "They can happen beneath the ocean though. They don't need to hurt anybody."

Separating east and west Antarctica, the Transantarctic range is one of the most important features in the continent's landscape. The 2,175-mile (3,500 km.) range, with peaks up to 14,700 ft. (4,500 m.), acts as a dam to hold back the East Antarctic ice sheet. It directs weather patterns and encloses the Dry Valleys. But many questions remain about what formed the Transantarctic range and what geophysical structures are beneath it.

A week ago the Transantarctic
See Quakes, page 10

Creating a position of power

By Mark Sabbatini
Sun staff

Alternative energy is finally a full-season occupation in Antarctica.

The growing use of solar and wind power on the Ice is doing everything from saving fuel to making seals feel more at home. This year the U.S. Antarctic Program's first full-season specialist is helping install and maintain such facilities.

"I've been doing one big job a week," said Alternative Energy Specialist Joe Yarkin, measuring a frame for a solar panel he recently installed on a hut at 11,000 feet on Mount Erebus. "Next year we're almost going to need two teams."

Most of the alternative energy work is at remote sites, where numerous scientists

Finding ways to be more efficient with alternative power in the field

Page 7

have been implementing their own projects for years. But at least one relatively large project - a prototype wind generator - is scheduled at McMurdo Station in the near future.

Previously, the mechanics at the Mechanical Equipment Center (MEC) designed and installed systems based partly on requests from grantees, wrote Andy Young, assistant manager of field science support for Raytheon Polar Services Company, in an e-mail.

See Energy, page 8

INSIDE

Bringing the Ice to the world live via the Web

Page 3

In the kitchen D.A. means definite attitude

Page 4

Quote of the Week

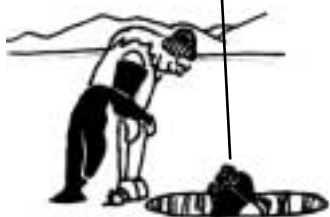
"If you can't be with the ones you love, you have to love the ones you're with."

- Ground crew worker on the holidays

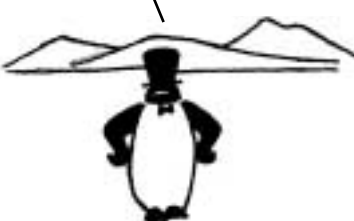
Ross Island Chronicles

By Chico

Wow, he's right. The sea floor is littered with one-cell organisms. They lie there and eat everything that falls to the sea floor. It's very spooky.



That's what I've been trying to tell you all along. Do you think I make this stuff up?



The new equipment works like a charm. I wouldn't trade anything for it.



Who knows what other creatures are down there.



WHOOAAA!!!
Did you see that?



Hey, thanks for the
scuba gear!



Cold, hard facts

Penguins

Number of penguin species world-wide: **17.**

Number of penguin species on Antarctica and surrounding islands: **Seven (Adelie, chin strap, emperor, gentoo, king, macaroni and rock hopper).**

Total number of bird species in the Antarctic: **350 million. About 50 percent are penguins.**

Largest penguin species: **Emperor. Their average weight is 65 lbs. (30 kilograms) and average height is 4 feet (1.7 meters).**

Smallest penguin species: **Rock hopper. They weigh about 5 lbs. (2.5 kilograms) and average 21 inches high (55 centimeters).**

Highest penguin divorce rate: **Emperors. After one year, about 78 percent of couples separate.**

Sources: seaworld.org, www.70south.com, CIA

The Antarctic Sun is funded by the National Science Foundation as part of the United States Antarctic Program. Its primary audience is U.S.



Antarctic Program participants, their families, and their friends. NSF reviews and approves

material before publication, but opinions and conclusions expressed in the Sun are not necessarily those of the Foundation.

Use: Reproduction and distribution are encouraged with acknowledgment of source and author.

Senior Editor: Kristan Hutchison

Editors: Melanie Conner
Mark Sabbatini

Copy Editor: Lynn Hamann

Publisher: Valerie Carroll,
Communications manager, RPSC

Contributions are welcome. Contact the Sun at AntSun@polar.org. In McMurdo, visit our office in Building 155 or dial 2407.

Web address: www.polar.org/antsun

Cosmic crossword

ACROSS

- 2) A "flower" used to see back in cosmic time
- 7) The equator divides them
- 9) Inner, outer and between
- 10) A lab without the white coats and petri dishes
- 14) Found in Hollywood and the sky
- 15) Relating to stars and nebulae
- 16) Invisible to you
- 18) Party favor and outer space data assistant
- 19) Caused by hot gases and bad economies

DOWN

- 1) Everything in all of existence
- 2) Does not interact with light
- 3) Where Antarctic space research is based
- 4) Breathe in the surroundings
- 5) Space traveler
- 6) Invisible, food-heating light rays
- 8) Artificial light won't interfere here
- 11) Mars, Venus, etc.
- 12) If not warped, the universe is _____
- 13) What started it all
- 17) Measurements for temperatures of light

Solution on page 11



Live: from the Ice... ...to the world

Exploratorium museum plans to film parts of Antarctica, field questions live

By Ben Murray

Special to the Sun

On Thursday, Dec. 6, Mary Miller sat in a sweltering office of Building 155 looking into a camera lens, a microphone pinned to her lapel. Some umpteen thousands of miles away, a group of children in a San Francisco museum called the Exploratorium sat staring back, peering at her on a big-screen TV. In what was to become the first of a series of daily communications between McMurdo, the Exploratorium and the world, Miller answered the kids' questions in a live webcast as if she were sitting right in the room with them.

They wanted to know how cold it was. A split-second's delay and she had an answer for them, plus footage of McMurdo to narrate over. Where are the penguins, they asked. Does Santa visit the South Pole?

Last Thursday's webcast marked the first successful attempt at providing a fully interactive question-and-answer session between Antarctica and the Exploratorium. Miller is the head of a four-person crew in town for a few weeks to produce the webcasts, which will cover topics ranging from underwater sea life to the volcanic grumblings of Mount Erebus.

The crew will be collecting video footage of some of the scientists, research projects and natural features around McMurdo through mid-January, but the focus of their work is allowing people around the world to view the outposts of science live and in real time.

"The aim of the project is to try and create as much of a window on how science is done as we can," said Julie Konop, a video producer with the team. To open that window, the crew is headed to the extreme edges of science in the Antarctic to beam back transmissions to live audiences.

The first big challenge was the summit of Erebus, where team members Paul Doherty and Noel Wanner went to collect footage of the volcano and talk live by phone to the Exploratorium. Wanner, a co-producer of the Antarctic project, said people of all ages showed up to ask questions.

"They wanted to know why the scientists are here. Why would they come to Antarctica?" he said. Wanner and Doherty fielded the questions from the lower Erebus hut on an iridium phone, and said the conversation went well. Getting outdoor footage of a frozen Antarctic peak was another matter.

"I found my eyelashes freezing shut," Wanner said, talking about how the moist breath of Erebus froze on both cameraman and camera. "Up on the rim it was really cold and the wind was howling."

The conditions have been tough on the gear as well. Wanner said motorized parts of the cameras are in constant danger of freezing up, even with a special protective layer called a "Polar Bear" housing wrapped around the camera. In such conditions the cameras also have to be warmed slowly after coming in from the cold, so condensation doesn't form inside the unit. Batteries retain the lifespan of a fruit fly.

With Wanner and Doherty back from the slopes of Erebus, the team is now gearing up to visit more Antarctic locations, including Cape Royds, the Amundsen-Scott South Pole Station and the Dry Valleys.



Photo by Melanie Conner/The Antarctic Sun

Mary Miller, right, answers questions from museum patrons in San Francisco as Julie Kanp films a live webcast at McMurdo Station.

The funding and opportunity for the four-person team to go on these much-envied boondoggles comes from the National Science Foundation's Artists and Writers grant and the unique museum that serves as their home base.

Billed as the "museum of science, art and human perception," the Exploratorium has traditionally been a place where people can experience science through hands-on activities instead of panes of glass, Konop said.

"It functions less as a museum than a playground for science phenomena," she said.

Seizing on the museum's interactive foundations and building on its front-line experience with webcasting, Miller began working on a grant to bring some of the biggest questions in science in front of a camera and present them live to the world. She got it.

The project, called "Origins," is taking Exploratorium crew members around the world to look at some fundamental questions of science, and Antarctica is just one stop on the trip. The aim is to present some of these scientific puzzles in an engaging and interactive fashion and show how scientists are working to solve them.

"We're looking at the story of science, looking for the origins," said Doherty, a physicist and science writer with the team. "What's the origin of the universe? What's the origin of Earth? Of life? To find these answers we go to the observatories of science." Exploratorium crew members have already been to the particle decelerator operated by the European Organization for Nuclear Research and the Space Telescope Science Institute, where the Hubble is monitored. Future trips will send Origins teams to study the foundations of biology, possibly in Belize.

In addition to the live webcasts, the crew is also busy updating their Web site with dispatches, journal entries, pictures and more footage of their exploits, making them a working team in perpetual motion.

"We're going to try to take Tuesdays off," Miller said. "We'll see how many we get."

The Exploratorium crew's Web site can be viewed at www.exploratorium.com/origins/antarctica/index.html.



Perspectives Perspectives

for the D.A., there is no mercy...

Have attitude, will travail

By Bill Miles

Special to the Sun

Listen up, Mr. And Mrs. Mactown. You think "DA" stands for Dining Assistant? You're only close. To be a true galley grunt at McMurdo Station, Ross Island, Antarctica, the A stands for attitude. Definite Attitude. Definite in-your-face Attitude. Even grunt colors-black and blue-shout Attitude. Capital A.

"TAKE THIS JOB AND SHOVE IT ... "Galley workers screeched out the song earlier this month during karaoke night at Gallagher's. It could be their theme. They wear grease splashes like badges of honor; they suffer fork punctures with pride. If they like the job, they're flat doing it wrong. No one likes it. No one re-ups for a second season. Each grimaces at the start of every shift and then delivers 10 of the toughest hours on the island. They are the sweat hogs of the south, the snarling crumb dogs of garbage.

Take Thailand's Ann Kunze, all 4 feet, 10 inches of her. She playfully clipped this writer with a right cross to the shoulder that left him black and blue for a week. At lunch she'll heft 1,300 pounds of porcelain in 90 minutes ... and you damn well better be out of the way. Add 240 pounds of flatware and 640 pounds of cups, glasses and bowls. She's lifted her ton for the day. And she's just warming up. She'll move on to the windowless pot room - temperature circa 125 degrees - sweat for another three hours scrubbing pots large enough for her to swim in. She grits her teeth. All the galley grunts grit their teeth. "TAKE THIS JOB AND SHOVE IT ... "

Their uniforms are soaked halfway through a shift ... perspiration, dishwater, mop-bucket floods. Do they make the big bucks for their effort? Sure. Their weekly pay is reportedly less than everyone on the Antarctic continent except shuttle drivers. At the very least, the grunts should have their names etched into The Galley floor. Hell, they sweep it, mop it and wax it

At the very least, the grunts should have their names etched into The Galley floor. Hell, they sweep it, mop it and wax it more in a single week than you do your home in an entire year.

more in a single week than you do your home in an entire year. They wipe up, clean up, pick up after you; they haul your trash and, if you blow smoke in their yard, they're tough enough to haul your ash onto Highway 1. Galley grunts, damn proud bunch.

Take Laena McCarthy from New York. She swings a mop badder than Barry Bonds swings a bat. Like most of the lady grunts, she's personable, beautiful. Any one of them could take over for Vanna White or Katie Couric. The guys? They're so ugly, they couldn't get a date with an inflatable doll.

What do these heroes think about their job? "Sucks" is the verb uttered most frequently. Does that make them back off? Not an inch. DA: Definite Attitude. Direct Attack. Pit bulls falling on a flock of ducklings.

Take Brent Rosato from Georgia. He's the guy in the stocking cap who, for some inexplicable reason, shaves his dome and grows hair on his face. He glides around the galley as smooth as Man 'O War and runs with a rugby ball like he was shot from a cannon. Head down. Moving. Get the job done. Before writing this piece, I strapped a pedometer on him. On a hot day, he averages 4.5 miles per shift; on the same day, says about 4.5 words. He knows it's the work that counts, not the words. Don't get in his way.

Occasionally, a grunt will take a few seconds to schmooze a pal. Another grunt

jumps his case faster than an ambulance-chasing lawyer can arrive at a five-car pile up. "Hey, mush-for-brains, if you got time to lean, you got time to clean. Capiche?" Both laugh. If YOU try that, gentle reader, duck ... or die.

Myrna Gary of Tucson is an ageless retiree with more pep than a pack of Energizers. As lead DA for the midrats, she does it all: dish machine, pot room, food server, sandwich maker, trash hauler, yada yada yada. Trying to keep pace with her is like trying to catch Jackie Joyner Kersee. You lose.

Phil Mitchell, from Virginia, lead grunt for the evening shift - another rugger who's played the game on all seven continents - once illegally drove a car north from Fairbanks on the Alaska Haul Road to a Beaufort Sea pipeline camp - 400 miles of gravel; raging Arctic blizzard the entire way. "What's a little snow?" he said to astounded pipeliners. In The Galley, he does the jobs no one wants, spending more time in rubber gloves than a proctologist.

Boss Hoss of the galley grunts is Shandra Cordovano. Her toughest task is walking the fine line between corporate Raytheon and 25 Definite Attitudes. She speaks both languages and drinks Morgan and Coke. When she's not running a vacuum or repairing the bug-juice machine, she's fixing a toaster or mediating a schedule squabble. She takes it all in stride. "I said that I'd do anything to get to Antarctica. I guess this is the test. The good news is that I work with great people."

All in all, the galley grunts look harmless enough. So did Little Boy and Fat Man. Don't be fooled. Walk softly ... the grunts wield big sticks. Shackleton would have taken any one of them in his boat.

Bill Miles, a.k.a. "Billy the Dish," is a DA, former reporter and former state legislator. This spring he faced a choice: run for governor of Alaska or come to Antarctica.

around the continent

PALMER

Revising the wreckage of the *Bahia Paraíso*

By Thomas Cohenour
Special to The Sun

The once shiny orange hull is now a rusted hulk. No longer does it proudly carry tourists and crew across the Drake Passage to Antarctic waters from Argentina. No longer does it carry food, medical supplies, Christmas cards and fuel to Argentine research stations. Instead, it rests nearly upside down in shallow waters near DeLaca Island 1½ miles from Palmer Station.

On Jan. 28, 1989, the 435-foot (134-meter) supply and research vessel *Bahia Paraíso*, operated by the Argentine navy, visited Palmer Station with 316 people, 82 of whom were tourists. As it made its way out of Arthur Harbor heading to Esperanza, an Argentine station on the peninsula, the *Bahia* struck a jagged rock, ripping a 30-foot (9-meter) gash in its hull.

All 316 people aboard the *Bahia* abandoned ship and sought refuge at Palmer Station via lifeboats. Imagine a small station built to house 40 people suddenly called upon to take in 316 hungry, shipwrecked survivors. Fortunately for those involved, no one was injured and all passengers were picked up by nearby tourist ships within a matter of hours.

A popular site to visit, the rusted hull of the *Bahia* rises some 4 feet (1.25 meters) above the ocean during low tide. Science divers, station personnel and tourists often stop at the *Bahia*. "I dove on the *Bahia* (for research purposes) a year after it sank," said Dan Martin with the Prey Component of the Long Term Ecological Research (LTER) (BP-028-O). "It was eerie because

the ship was still settling and making creaking noises." Assessment of the impact to the environment began hours after the ship sank and continues every year, although divers never enter the sunken ship because of the inherent dangers.

Dave Kushner, also with BP-028-O, commented that "The *Bahia* is really an interesting place to dive because of the colonization process that's occurring there." Compared to the rest of the underwater habitat, the *Bahia* as a growth substrate is quite new. It provided a clean surface where scientists can watch competition among species as to what organisms colonize and when. And this has been a

special opportunity to monitor recolonization by organisms. Now, 12 years after the sinking, there is a very dense layer of plants and invertebrates on the hull. Some colonize more quickly and spread over a new surface. Other plant species may be more dominant but slower at colonization and, over time, displace the previous organism in part or in whole. Since hull space is a limiting factor, the competition has given scientists some insight into

interspecies success strategies.

Estimates about the amount of fuel that spilled into the environment from the shipwreck range from 160,000 gallons to 350,000 gallons. Researchers at Palmer Station continue to monitor the effects in the environment caused by the fuel spilled over 12 years ago. Surprisingly enough, nearly all populations of species have returned to the levels they were at prior to the fuel spill. The exception is the cormorant birds which have all but disappeared from Cormorant Island. Intertidal algae, limpets and other bird species are doing well. More than a decade after this major fuel spill, scientists have found that the ecosystem is much more resilient than originally thought.



Photo by Tom Cohenour/Special to The Antarctic Sun
The underside of the shipwrecked *Bahia Paraíso* can still be seen near Palmer Station.

SOUTH POLE

A 90th anniversary

By Katy Jensen
Special to The Antarctic Sun

On Dec. 14, 1911, the original South Pole Station was built.

This was the day that Amundsen and his team - Hanssen, Hassel, Bjaaland and Wisting - became the first men to reach the South Pole, claiming victory for Norway.

A celebration of the 90th anniversary of this occasion occurred at noon as workers at the station moved the Norwegian flag from the Ceremonial Pole to the Geographic Pole. Twelve hours later they the flag down for shipment to the National Science Foundation and further distribution to our Norwegian cousins.

Both ceremonies were accompanied by dramatic readings, moments of quiet introspection and other activities.

The NSF has formally directed us to stop working toward this season's "conditional acceptance" of a winter housing area in the new station. We had hoped to move about half of the winter crew into the second floor of the elevated station, but it looks like we'll spend another year in the hypertats (modified Jamesways) instead. Bummer.

This was a big week for Twin Otter activity. The crews stop here briefly to fuel up and acclimate to the altitude before moving on to middle-of-nowhere field camps, such as the following:

* Reedy Glacier (85.7 S, 131.5 W): A group from Syracuse University is studying the "timing and mechanisms for the formation of the rift system in West Antarctica and the Trans-Antarctic Mountains." The rock samples they collect will be analyzed back in New York using "thermochronologic techniques." If any of you geologists want to explain THAT one to me, I'd be interested to learn what's involved!

* AGO2 (85.7 S, 46.4 W): There are six of these Automated Geophysical Observatories (AGOs) scattered across the interior of Antarctica. Each station is

See Pole, page 6

the week in weather

McMurdo Station

High: 41F/5.2C Low: 10F/-12.3C
Wind: 56 mph/90 kph
Windchill: -36F/-38C

Palmer Station

High: 38.3F/3.5C Low: 24F/-4.4C
Wind: 56mph/90kph
Precipitation: /16.5mm

South Pole Station

High: -9F/-23C Low: -24F/-31C
Wind: 23mph/37kph
Windchill: N/A

Pole

From page 5

meant to operate for 12 months without human support, so each austral summer, a team of technicians travels to each site to perform services and upgrades. AGO data are sent to Augsburg College in Minneapolis for processing.

Grantees from Augsburg College also operate magnetometers, which monitor fluctuations in the Earth's magnetic field, here and in McMurdo. In fact, there are quite a few Antarctic Scientists in Minnesota! Check these out:

* (St. Olaf College) "Radar Studies of Internal Stratigraphy and Bedrock Topography along the U.S. ITASE Traverse" (<http://www.stolaf.edu/other/cegsic/itase>). ITASE is the International Trans-Antarctic Scientific Expedition... involving two "trains" of buildings and vehicles, pulled by Challenger 55 Caterpillar tractors from Byrd Surface Camp to Old Siple Station and back to Byrd. Along the way, the team is collecting ice cores, surface snow and ice samples, meteorological observations and radar profiles of the Ice Sheet. If I can convince Rod and Zube to join me in a two-person (and one-smuggled-dog) gas station in the middle of Antarctica it'll be to support the ITASE traverse next season!

* (University of Minnesota/Department of Ecology, Evolution and Behavior) "Use of Long-Term Data Base and Molecular Genetic Techniques to Examine the Behavioral Ecology and Dynamics of a Weddell Seal Population." This seal research began in the late 60s, and though it's not clear how a Minnesota institution got involved, Dr. Siniff is studying seal



Photo by Carol Crossland/Special to the Antarctic Sun
Ice sculpture of a headstander near the South Pole marker created by Josh Miller.

blood mere blocks from our house in St. Paul. Small world.

Even Smaller: Also on the U of M farm campus, in the Department of Plant Pathology, there's another group studying the "Deterioration in the Historic Huts of the Ross Sea Region in Antarctica." This group collects samples to determine biological and non-biological agents that are destroying the historic huts left in

Antarctica by Shackleton and Scott.

Speaking of history, Dr. Susan Solomon just sent us an autographed copy of her excellent book: "The Coldest March." In it, she describes how weather played a part in the outcome of the Race to the Pole. A highly-recommended read! And for more fine reading about Pole Things, you gotta see Bill Spindler's Web site - no doubt the best South Polar Web site there is - at <http://www.southpolestation.com>.

On Saturday, we received word that the McMurdo crew was successful in preparing a new snow-compacted runway at the Pegasus site. With Pegasus certified (all season) for wheeled aircraft, we can bring in extra planes from the 'States for the Christchurch-McMurdo shuttles (courtesy of our Air Force colleagues in Little Rock - thank you!) and then use all of the USAP ski-equipped planes between McMurdo and South Pole. This represents 40 flights of our planned 348, and we're thrilled to benefit from McMurdo's success.

On Saturday night we celebrated with the first-ever (that we know of) full-contact BINGO NIGHT at South Pole, complete with a wire-cage ball dispenser and cardboard bingo cards. Didn't have enough plastic chips for the cards, though, so we had to resort to using pennies and then beans. I disappeared before the "BEAN-O BINGO" began. Somehow, I think Midwestern church bingo nights must be a little tamer, but hey: never assume anything. And there is no end to recreation here with poetry slams, ski and run clubs, Bible study, six-pack rehab (abdominals, not Budweiser), movie nights, concerts, dance, yoga and bouldering.

Continental Drift

If it was up to you, what would add to your station?



"As it sits now, my Jamesway has snow coming in the wall. I would fix that."

Kevin Culin
NSF technical rep for
IT for South Pole
from
Columbia, Md.



"Sea kayaks and sailboats for recreational use."

Cara Sucher
Asst. Lab Supervisor at
Palmer Station from
Denver



"Everyone has their own personal helo to travel to and fro. Mine would be customized, because I've heard I'm too small to be a pilot."

McKenzie Winters
Janitor at McMurdo
Station from
Washington state

Switching to solar and wind can require some creative thought

Making the most of alternative power

By Kristan Hutchison

Sun staff

The power plant hovers a few feet above the ground, a black pyramid dangling from a helicopter.

Once settled on a hilltop near Lake Hoare, four flaps open to reveal solar panels. The entire unit is self-contained, designed to be left there, collecting data, while the scientist goes home.

"It looks like a little moon lander," said Tony Hansen, the scientist and engineer who designed the solar-powered pyramid.

With it, Hansen can drop his air-monitoring equipment anywhere - on a hill in the Dry Valleys, in the middle of frozen lake, on the polar plateau. The power pyramid produces 60 to 70 watts in bright sunlight, half as much in clouds.

That's enough to run Hansen's air monitoring equipment all season, though it wouldn't have been originally. The equipment used to require 600 watts. Hansen re-engineered it to work more efficiently, so now it draws just 20 watts.

With similar engineering, most scientific equipment could run with less power, Hansen said. He has another National Science Foundation grant to continue testing and developing the power pyramid over the next three years.

The self-sufficient power modules could reduce the need for generators, thereby reducing air pollution. That will be particularly important in areas deemed to have Special Scientific Interest, including the Dry Valleys.

"In the Dry Valleys we would like to get to zero emissions," Hansen said. "It's not a matter of logistics. It's not a matter of science. It's a matter of the environment."

Among those who might eventually benefit from greater alternative power efficiency is Randy Davis, a seal researcher who said he wants to switch but doesn't find it feasible now.

Noise and vibration from the generator at his camp can show up on some of the recordings his research team takes, and may even be altering the behavior of the seals they study, Davis said. As they study how the seals navigate through the water, Davis wonders if seals use generator noise to lead them back to the breathing hole.

"We would like to wean ourselves off a diesel generator, but we cannot function off just 300 watts," Davis said.

Davis' seal camp uses about 2,000 watts. The solar units available at McMurdo Station can't provide that much power, but Hansen believes Davis and



Above, camp manager Ray Spain turns the solar panels which power Lake Hoare in the Dry Valleys to catch the afternoon sun.

Tony Hansen, right, shows the power pyramid he designed, a self-sufficient solar collector which powers his air monitoring equipment. He modified the monitoring equipment, which originally required 600 watts, so it now operates on just 20 watts of power.



other scientists could reduce their energy needs.

"They're using 1,000 watts of bulbs just to light the place," Hansen said.

Besides more efficient lighting, replacing desktop computers, large monitors and other standard appliances could improve power-efficiency, Hansen said.

"What really sucks down the batteries are things that take a lot of power and are on all the time," Hansen said.

At Lake Hoare, one piece of equipment uses most of the power: an old incubator which must run continuously when in use.

"That single item, when it's on, drains half the power of the station," Hansen said. "It was not adapted to the specific rigors of the field. It didn't PQ in other words."

New incubators use much less power, Hansen said.

Without the incubator, the Lake Hoare camp uses a couple hundred watts. Three solar panels supply all the camp's needs, including a bread machine, compact disc player and a few other luxuries.

"(Solar) has always worked very well for us," said camp manager Ray Spain. "Everyone likes it a lot and wishes there were more."

What camp residents and visitors notice most is the quiet. Without the roar of generators they can hear the glacier nearby cracking and waterfalls running down as the sun melts it.

"The scientists are all in agreement that if they can stop using the diesels it's better all around," Hansen said.

Power

From page 1

But he stated the number of projects, due in part to equipment purchased with a \$100,000 grant from the U.S. National Renewable Energy Laboratory, got too big for such treatment last year.

"The use of alternative energy had grown to the point that it was no longer a sideline, and needed dedicated, focused support," Young wrote.

A specialist, Tracy Dahl, was hired for two months last year, with Yarkin hired for the full season this year. Yarkin said there are plans to do installation or maintenance work at nine remote sites this year, in addition to numerous requests from researchers.

"What we're trying to do is replace our generators with solar systems wherever possible," he said.

The addition of solar power has been a notable success for Mike Cameron, field team leader for a Weddell seal research project at Big Razorback Island. A fuel-powered generator was being used six hours a day at their huts on the sea ice about 300 feet offshore, he said, and seals apparently disturbed by the noise were avoiding that part of the island. That changed when solar panels were installed last season.

"We've noticed that seals are not restricting their movements any more and it coincided with the use of solar power," he said.

Cameron said he also requested the solar panels in the hope of getting a more constant supply of power for the laptop computers, battery charges and underwater video camera used at the site. He said to date "we don't have any complaints at all" about the performance of the panels.

The installation by Yarkin at Erebus includes six solar panels rated at a total of 450 watts, similar to the power a remote cabin might be equipped with, Yarkin said. He said that is enough power to run laptop computers, radios, a bread maker, TV, VCR and "for a short time they can run an espresso machine."

"When people start wanting space heating with electricity and they want snow melting with electricity we say no," Yarkin said. At that point, he said, he advises people to collect the sun's heat directly or use a fuel heater.

Insulated boxes provide the batteries some protection from the cold and the batteries give off a small amount of heat when they are being charged by the solar panels, Yarkin said. The batteries are gel-cells, designed for low maintenance and safe shipping by air. A wind generator at Erebus powers the same batteries.

Yarkin said a hybrid system combining



Photo by Mark Sabbatini/The Antarctic Sun

Joe Yarkin checks underneath a set of three solar panels inside a shelter on Mount Erebus.

wind, solar and a fuel generator is often used at sites where power is needed year-round since there is no sunlight during the austral winter.

His duties vary widely, often on a daily basis. Some days it isn't much different than any number of blue-collar jobs on the Ice - drilling, hauling, sawing and bolting. Other days he needs to choose and order equipment, test items, come up with plans for distributing them and plenty of other tasks. It also involves a lot of one-day trips to remote areas.

In many aspects it's an ideal job, Yarkin said, but a 30-minute helicopter commute from sea level at McMurdo to a location such as Erebus camp - which has an effective altitude of about 12,500 feet - can make for a challenging shift.

Permanent alternative energy installations are at Lake Hoare, F-6 at Lake Fryxell, the Lower Hut at Mount Erebus, Fishhut 5, and the kitchen and dorm trailers used by the U.S. component of the International Trans-Antarctic Science Expedition (ITASE), Young wrote.

"We also have a large number of portable installations of various sizes, some as large as the permanent installations, some as small as a single 30-watt panel," he wrote.

Possible future solar sights include a potential new hut at Lake Bonney and more fish huts and sea ice camps, Young added.

The field science support section has about \$250,000 worth of alternative energy equipment, including what was pur-

chased with the federal grant. Young stated allocation of the resources is based on a combination of planned RPSC construction projects and requests from researchers.

"Occasionally, we will look at a science group's plan, and see a situation where alternative energy could benefit their operation, or simplify logistics," he wrote. "In those cases, we will work with the group to determine what system will work best for them, then design and install it."

"For the most part, these decisions are made by RPSC in conjunction with the grantees, as all current systems have fit within our normal budget," Young added. "Were we to do any major installations, such as a new hut at Lake Bonney, we would probably be asking NSF for special funding for the specific project."

Managed and purchased separately are a series of solar and wind generators for communications operations. The largest is the main communications facility for McMurdo at Black Island, which has 60,000 pounds of batteries charged by wind and solar generators. The island's barrel-shaped wind turbines weigh 600 pounds each, feature 8-foot-long propeller blades and are mounted on 40-foot towers.

Other equipment includes about 20 portable solar repeaters, which provide communications capabilities at remote sites.

RPSC Communications Systems Supervisor Bill Nesbit said no major changes or upgrades are planned soon,

See Power, page 9

“

When people start wanting space heating with electricity and they want snow melting with electricity we say no.

”

- Joe Yarkin

Joe Yarkin adjusts the fittings on a solar panel on top of a mountainside shelter located at about 11,000 feet. A set of six panels and a wind generator will replace much of the power currently supplied by a fuel generator. Mount Erebus is in the background.

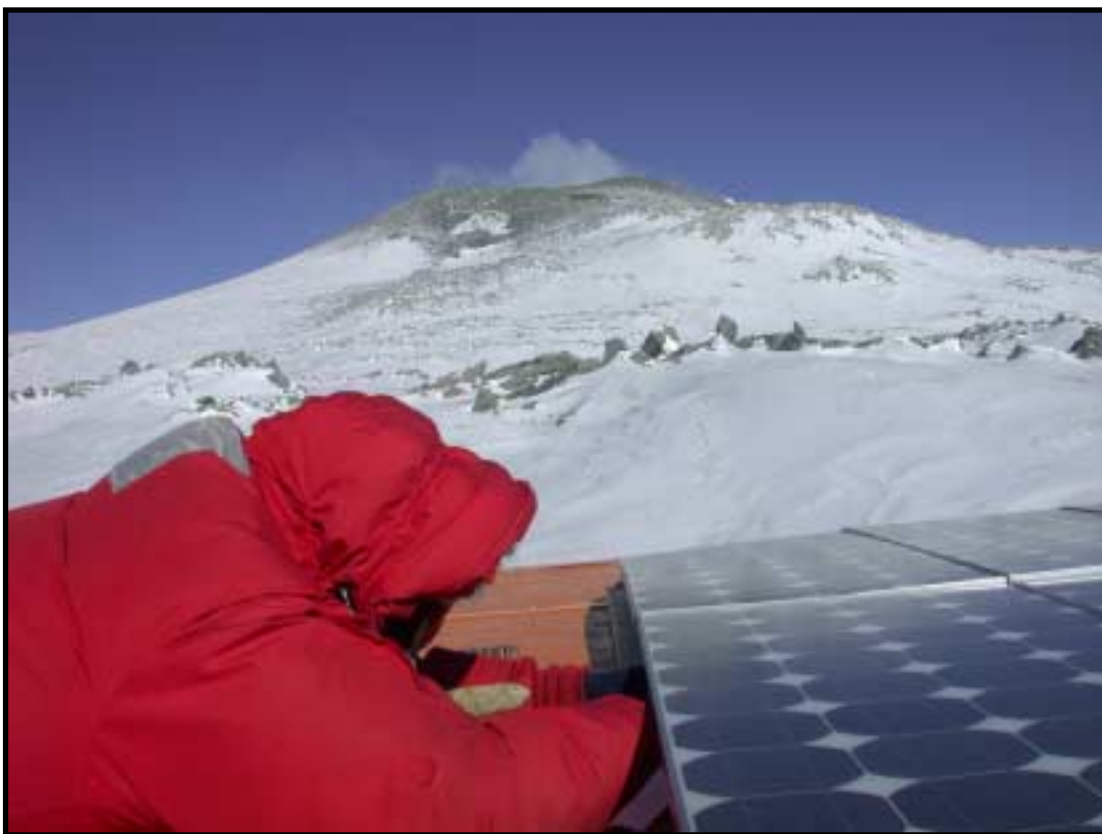


Photo by Mark Sabbatini/The Antarctic Sun

Power From page 8

although another 10 solar repeaters are expected within the next few years. Also, being tested at McMurdo's T-site is an experimental 24-foot-tall cone-shaped wind turbine mounted on a 30-foot tower. Nesbit said officials hope the design will withstand high winds better than traditional propeller blades that can break in such conditions.

Another McMurdo test project is one of three prototypical wind generators designed for cold weather situations, said NSF Station Manager Bill Coughran. He said the generator provided by the U.S. Department of Energy, complete with an 80-foot tower, is expected to arrive in January of 2003 and may be installed by the austral summer.

"It'll be the tallest thing at McMurdo for sure," he said.

The generator's maximum 100-kilowatt power rating is only 5 percent of what McMurdo uses, Coughran said. He said that isn't enough to power the galley and other facilities in Building 155 - and even if it were there are other limiting factors.

"Some of the problems with alternative energy systems is because of the need for reliable power you end up having to need a full diesel generator power system anyway," he said.

Other significant advances could be years away.

Alternative energy events planned for solstice

An exhibit featuring solar- and wind-powered equipment will be on display at McMurdo Station this week, and activities emphasizing their use are planned when winter solstice occurs Dec. 22. Alternative Energy Specialist Joe Yarkin said the outdoor exhibit will be on display between the Chalet and Cray lab.

A small wind generator, a portable solar panel model used as an energy source at camps and a solar tracker will be among the items on display, Yarkin said. He said scientists who might use such equipment in the field are his primary focus, but also hopes other employees will come up with suggestions for their use.

Nesbit said he would like laminated solar panels that can be wrapped around objects and therefore achieve 360 degrees of exposure to the sun, but doesn't expect them to be easily obtainable for at least 10 years. He said it could take a similar amount of time before fuel cells that don't freeze from the water vapor they generate are available.

But there are also plenty of success stories in equipment advances.

The Antarctic Network of Unattended Broadband Integrated Seismometers (ANUBIS) ran six remote seismometers year-round on solar and wind power. The seismometers themselves use only a few watts, but another 15 to 20 watts are needed to run heaters to keep hard disks the data is stored on warm enough to run. One of the seismometer stations ran continuously for two years on the wind and solar power, without missing a day, said Senior Research Assistant Don Voigt.

"They stayed warm and happy and gave us great data. That was a big techni-

cal achievement for us," Voigt said.

It worked well enough that a new project has expanded the concept with 42 seismometers across the TransAntarctic Range.

Through trial and error they've settled on a brand of wind generator that can withstand Antarctic conditions, though the grease in it has to be replaced with grease that won't freeze at 30 below. The wind generators that didn't work were turned over to Yarkin to take apart and figure out what went wrong. Other science groups are now using the solar panel design developed for ANUBIS.

Voigt expects alternative energy to continue to develop, and expand the abilities of remote science as it does.

"Right now the combination of solar and wind is about what we have. I think in about five years you'll see some fuel cells down here," Voigt said.

Sun reporter Kristan Hutchison contributed to this article.

Quakes

From page 1

Mountain Seismic project, or TAMSEIS, placed its final seismic station on the polar plateau, completing the largest seismic array in Antarctica.

It's a project referred to as aggressive, or crazy, depending on whom you talk to, said Don Voigt, senior research assistant for TAMSEIS.

Proving them wrong, the 15-member team set up 42 seismic stations in two months and finished with time to spare.

"Some people thought we couldn't do it," said Sridhar Anandakrishnan, from the University of Alabama and one of three principal researchers on the project. "It was extremely ambitious."

Careful planning, good weather and a few 18-hour workdays made it possible to complete the project quickly, said Andy Nyblade, another of the project's principal investigators.

"One of the biggest challenges for the project was installing seismometers on the polar plateau," he said. Winds were stronger than expected, he said, sometimes reaching about 40 mph (64 kph).

The seismometers were laid out along three lines. One array crosses the mountain range, stretching from McMurdo Station halfway to Dome C on the plateau. The other goes from Terra Nova Bay along the inland side of the range onto the polar plateau near AGO 4. The third string of seismometers parallels the range on the coastal side.

The seismometers themselves are metal cylinders, "like two number 10 cans of onions stacked one on top of each other," Anandakrishnan said. Inside, a sensitive instrument reacts to vibrations in the ground. A sensor measures how much the ground moves and records it to a hard disk, where the data is stored until the researchers retrieve it next summer.

The seismic recorders can sense 5.0 magnitude earthquakes from as far away as California and smaller quakes from closer areas. Generally they record a few useable quakes each day, Anandakrishnan said.

The researchers compare the seismometer record to the U.S. Geological Service catalog of earthquakes, which gives the precise time, place and magnitude. With the parallel lines of seismometers, they will be able to tell how much time it takes ener-



Photo by Tim Parker/Special to The Antarctic Sun

Researchers prepare a seismic study site on the polar plateau. Solar panels to power the equipment are seen to the left.

gy from a particular earthquake to travel through the Transantarctics. Vibrations average speeds of 18,000 mph per second, Anandakrishnan said. GPS clocks attached to the seismometers record the arrival times of the quakes to the millisecond, so the researchers can compare speed variations of just a few percentage points.

"The amount of time it takes that earthquake to move through the mantle and through the Antarctic crust, that tells us a lot," Anandakrishnan said. "That's what we're going for."

With that data they can extrapolate how thick the Earth's crust is in specific areas, the temperature of the land mass and essentially map the topography of the Earth under the ice.

"That gives you information about the roots of the Transantarctic Mountains," Voigt said. "The best way to think about it is just a CT scan of the Transantarctics."

Setting up the seismometers for TAMSEIS went well this year partly because Anandakrishnan and Voigt have been working with the instruments in Antarctica for five years, as part of a smaller project, the Antarctic Network of Unattended Broadband Integrated Seismometers or ANUBIS.

"ANUBIS was a proof of concept," Anandakrishnan said. "That was sort of the project that led into this other, much larger project."

ANUBIS used six seismic stations, spread 186 to 248 miles (300 to 400 km.) apart across West Antarctica, to study the deep rift structure there. Anandakrishnan used the seismic recorders to measure the thickness of the Earth's crust around the rift and try to determine how seismically active the rift is.

"We observed some local seismicity, but nothing like we see in other local rifts," Anandakrishnan said.

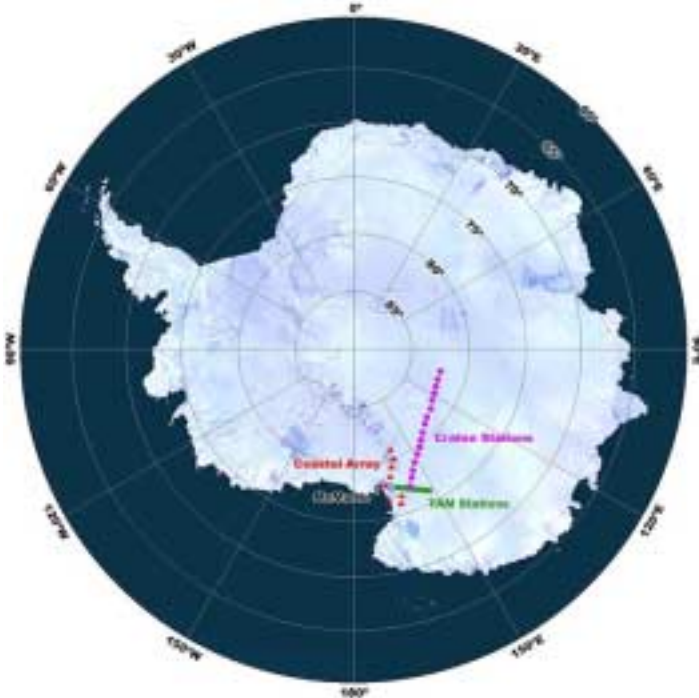
Instead of several quakes a day, as similar rifts elsewhere in the world have, the West Antarctic rift produced a few extremely small tremors each month.

"It's an order of magnitude less," Anandakrishnan said. "You wouldn't feel it at all."

He's unsure why the rift is so quiet. It could be because liquid water below the ice lubricates the rift, allowing the sides of the fault to glide smoothly without building up the tension that produces quakes. Or the heavy ice sheet bearing down on West Antarctica could be suppressing any underground activity. The ice sheet presses down with 10 megapascals, or about 209,505 pounds per square foot of pressure.

"It's as if you were balancing a column of ice a mile high on your head," Anandakrishnan said. "It's that weight."

ANUBIS taught them some practical lessons. When they started, they buried the seismometers in pits 10 feet (3 meters)



A TAMSEIS map shows where seismic stations have been placed.

See Quakes, page 11

Quakes

From page 10

deep, which took a day and a half to dig. The pits were meant to protect the seismometers from wind and other surface noise, but they discovered they were unnecessary, Voigt said.

This year the science teams removed the ANUBIS seismometers from West Antarctica, and put in the TAMSEIS seismometers along the Transantarctic range. With years of practice, careful planning and some luck, the TAMSEIS instruments took only a few hours to install this year.

"It's fairly straightforward, just because we've spent years evolving the system," Voigt said.

The TAMSEIS seismometers are much closer together than the ANUBIS ones were, about 12 to 50 miles (20 to 80 km) apart. The results should be much more detailed, and provide insight into why and where the Earth's crust changes thickness, from about 17 miles (28 km) on this side of the Transantarctics, to about 26 miles (42 km) on the other side of the mountains.

The new seismic array could also answer some questions about the East Antarctic craton, the large land-mass underneath the polar ice sheet. Below its heavy burden of ice, the land mass is currently near sea level, Anandakrishnan said. But if the ice were to disappear, the land would rise more than half a mile (about 1 km.) above sea level, he said.

Though land often rebounds after the weight of glacial ice recedes, the amount the East Antarctic land would rise is unusual. As part of the main continent, East Antarctica is considered old, even in geological time. While volcanic areas, rifts and fault lines regularly toss up new, molten rock, recycling the older rock below, continental interiors are generally more stable and older.

Formed billions of years ago, the older landmasses are also colder, having had more time to cool from the original molten

phase.

"An old continent is cold and colder things are heavier," Anandakrishnan said.

But not East Antarctica; though old, it's buoyant.

"Something that is that old shouldn't be that light," Anandakrishnan said.

Anandakrishnan hopes the seismic data will provide an explanation. One possibility is that the Earth's mantle is warmer in that region, heating the continent above it and making it lighter.

"Oddly enough, the ice is a great insulator," Anandakrishnan said. Like a thick quilt, the ice blankets the continent, holding in the heat coming up from underground. That geothermal warmth melts the bottom of the ice sheet to produce liquid lakes and keeps the land warm.

"As far as the rock and the land is concerned, it's in a nice, toasty warm, environment," Anandakrishnan said.

Just how warm is difficult to measure with miles of ice in the way. In the Dry Valleys researchers have dropped thermometers into deep drill holes to measure the temperature at various depths, but 98 percent of Antarctica is under ice. That's when the seismometers come in handy again. Vibrations move faster through cold rock than warm, so Anandakrishnan can judge the subsurface temperature by how fast the tremors travel.

"The speed at which seismic energy travels through a rock is related strongly to its temperature," Anandakrishnan said.

Another possible reason for East Antarctica's buoyancy may be that the upper mantle of the Earth is less dense in that area, Wiens said, "but exactly what we'll find out I don't know."

Next year the TAMSEIS team will return to swap out hard drives containing a year's worth of earthquake data and replace equipment that's not working or been damaged. By November they could have preliminary results.

"It should be a lot saner year," Voigt said.



Photo by Tim Parker/Special to The Antarctic Sun

A TAMSEIS camp member digs a hole in the snow for seismic research equipment.

It'll be a white Christmas after all



Photo by Melanie Conner/The Antarctic Sun

After weeks of unseasonably warm weather, a McMurdo Station worker struggles to get through a three-day storm featuring winds of more than 100 mph and snow drifts several feet high. "The area of the storm is larger than the size of France," said Weather Station Manager Chester Clogston. Conditions improved Saturday.

Answers to crossword from page 2





Profile

By Mark Sabbatini
Sun staff

Construction cooking and cameras

Foreman Pat Plaia captures the Ice's landmarks on film while helping build new ones

By Mark Sabbatini
Sun staff

Pat Plaia knew it was time to look for a new position when he ran out of things to shoot.

The science foreman from Eugene, Ore., has spent the past three years working as a carpenter and foreman, and photographing as much as possible at the South Pole. He sells his work at art shows during the off-seasons. This season he transferred to a job as science carpenter foreman at McMurdo Station that lets him see much more of the continent as he supervises set-ups and other projects at various remote camp sites.

"It's an odd position," he said during a three-week "put-in" at Byrd Surface Camp, about a three-hour flight southwest of McMurdo. "There's not really a good description for my job," he said. "A lot of it is just kind of an oral tradition that's passed from foreman to foreman."

He's also gained notoriety for his morale-boosting attitude and gourmet camp cooking, often using ingredients that have been frozen under snow for a year or more.

"I grow basil at home and make my own pesto," he told a co-worker at Byrd as they dined on steaks, noodles with Alfredo sauce and artichoke hearts, and a vegetable casserole.

"His pasta is famous," said Chuck McClellan, a carpenter who worked with Plaia at Byrd camp. "Having a lot of Italian in him I suppose that's inevitable."

Plaia's construction work can be seen at the snow school and sea ice training sites near McMurdo, the F-6 camp in the Dry Valleys, Dempsey Camp, the Lower Camp at Erebus and other locations. He said the job is great for all the expected reasons - lots of travel, good co-workers, plenty of different things to photograph - but getting started when he arrived at Winfly in August was tough.

"My learning curve was like a wall," he said. "It was spooky at first."

McClellan, who knows Plaia from years of encounters at The Country Faire in Oregon, said his supervisor has adopted



Photo by Mark Sabbatini/The Antarctic Sun

Foreman Pat Plaia cooks a steak dinner for workers at Byrd Surface Camp.

well.

"He brings out the loyalty in the troops without being militaristic or coach-like," McClellan said.

Working in the field means long hours, but Plaia makes sure he has plenty of film along with his tools when he is deployed. He said he specializes in black and white photography, but the interests of buyers tend to run beyond shades of gray.

"People say they love it, but then they buy elsewhere," he said. "I realized people buy big color prints."

Plaia grew up in Indiana, the second of five children, learning to cook for the family after his oldest brother went to college and his mom took a job.

He spent most of his adult life in the Pacific Northwest after hitchhiking there as a youth. In the early 1970s he helped start a group in Oregon called Hoedads.

"It was a big cooperative tree-planting company out of Eugene," he said.

He did similar reforestation work in other areas of the Pacific Northwest and Alaska. He also spent eight years as a high climber, rigging trees for logging and cre-

ating Northwest wildlife habitat snags by "blasting tree tops." Logging often eliminated the dead tree tops where 20 to 30 percent of the woodland creatures lived, he explained, so making new dead snags in the tops of other trees provided a home.

"We got to travel all over the Northwest and climb trees for a living," he said.

Plaia subsequently got into construction work when the timber industry went into a decline, since most of the companies he worked for were cooperatives. He said he worked for a construction crew that mostly built bridges, plus numerous piers for the U.S. Coast Guard.

Glen Corbett, a woman he met while working on a fire watch tower, had worked at the Amundsen-Scott South Pole Station and provided Plaia with his first contacts there. With lots of construction projects - and things to photograph - Plaia thought it offered plenty of possibilities.

"A crane is a crane and rigging loads are rigging loads, so I thought I could handle the work," he said.

But his long background in construction didn't completely prepare him for the conditions he faced.

"My first day of work down at the South Pole I was with a whole new crew," he said. "The wind chill was about 110 below (Fahrenheit). I lay in bed thinking 'What did I get myself into? I can't do this for four months.'"

Plaia said he adjusted within days, however. He learned to make similar adjustments when facing another unfamiliar situation - operating a computer for Raytheon Polar Services Company in Denver during his first off-season. He worked two more seasons at the Pole before deciding it was time to move on.

"I liked my job at Pole, but I just ran out of things to photograph at the Pole," he said.

That hasn't been a problem with all the travel this year. Plaia said he isn't sure how long he wants to keep working on the Ice, but isn't planning to leave anytime soon.

"If they keep sending me different places it could take quite a while," he said.